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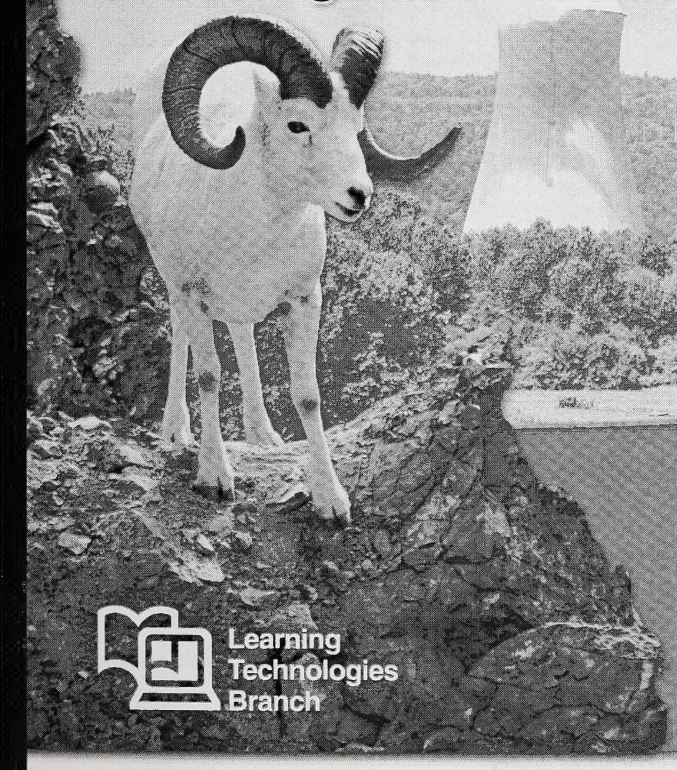
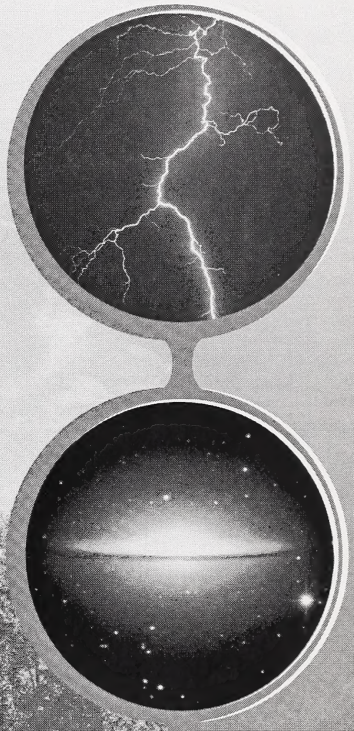
SCIENCE 9

Module 1

Biological Diversity

Home Instructor's Guide and Assignment Booklet 1B





Learning Technologies Branch

Alberta LEARNING

Science 9
Module 1: Biological Diversity
Home Instructor's Guide and Assignment Booklet 1B
Learning Technologies Branch
ISBN 0-7741-2570-5

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The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

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- Alberta Learning, **http://www.learning.gov.ab.ca**
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Section 3: The Impact of Human Activities

In this section the student examines the effects of human activity on biodiversity. The student investigates the effect of artificial breeding of animals and plants on diversity within species. Knowledge of artificial breeding provides insight into natural processes that contribute to biodiversity. The student sees that some types of human activity can threaten biodiversity but that others can positively affect biodiversity. The section concludes with a variety of positive human actions to protect and promote endangered species and biodiversity around the globe.

Note that this section deals with the theory of natural selection developed by British naturalist Charles Darwin. The junior high program of studies, *Science 7–8–9, 2003*, requires students to "distinguish between, and identify examples of, natural and artificial selection (e.g., evolution of beak shapes in birds, development of high milk production in dairy cows)." Accordingly, the theory of natural selection is included in this course.

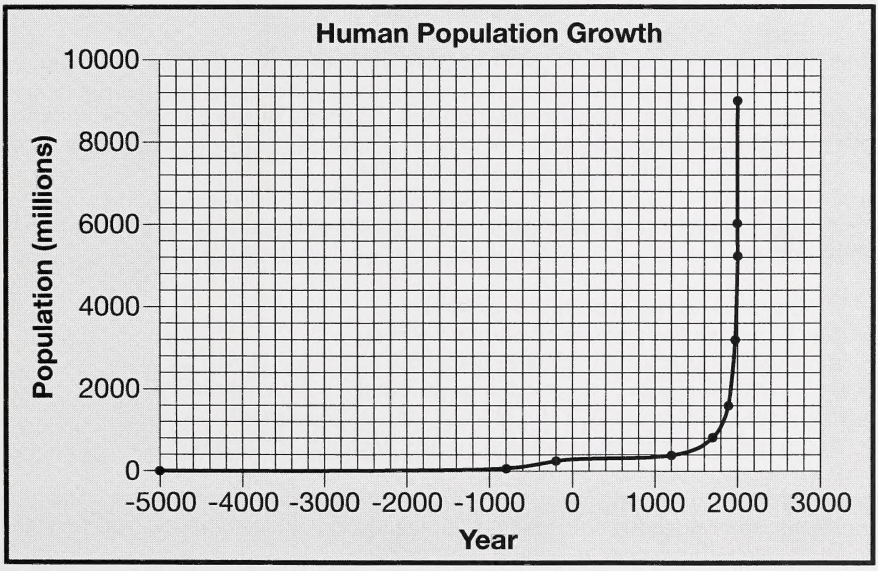
The theory of natural selection and its use to explain biological diversity may be inconsistent with some religious beliefs. Discussing this theory may require sensitivity to a variety of religious perspectives.

No extra materials are needed for this section.

Suggested Answers

Section 3: Lesson 2

8. Here is a sample line graph.



Note: BCE stands for *before the common era*. Negative numbers in the graph represent years designated as BCE.

9. Textbook questions 1 to 3 from "Analyze," page 70:

1. Initially, the human population grew very slowly. In the last 1000 years it has "exploded" (increased at faster and faster rates).The global human population is increasing exponentially. This means that as the population increases, the rate of population growth increases. The rate of growth will continue to increase until some factor—food, space, disease, birth control—limits further growth.

2. Students can extrapolate by extending the line upward. Remind students that extrapolations are predictions made that go beyond the range of the measured data. With the human population increasing so quickly, at this point, the extrapolation is likely to be inaccurate.

3. Inaccuracy in plotting and scaling can cause incorrect predictions. The degree to which the slope of the line changes is difficult to determine. In the real world, limiting factors can decrease the projected population increases.

   Note: The global population has not increased at previously reached levels due to changes in factors such as

   - attitudes concerning the need for many children
   - government support in old age
   - increasing education levels
   - a series of drought-related famines
   - civil wars in a number of developing countries

   Improved food production, storage, processing and distribution, as well as better health care, positive climate change, and a decrease in "war-like" activities can lead to population increases.

11. Textbook questions 1 to 3 from "Analyze," page 71:

1. Answers will vary because this involves personal opinions. Some factors could be

   - concerns about the natural vegetation and the threat of soil erosion at Suffield
   - a hope that the horses remain free
   - wanting to see the horses fed and given shelter

2. Answers will vary. Sample questions that students would want to know the answers to could include the following:

   - Is the animal native, introduced, or feral?
   - How long have the animals inhabited the area?
   - What part do they play in their ecosystem?
   - How will their removal affect other populations in the community?
   - How does the animal affect the biodiversity of the habitat?
   - Would decreasing its population solve the problem of spreading disease?

3. Alternatives could include decreasing the population by periodic culling, applying contraceptive vaccinations, and relocating animals to other wilderness areas. Opinions will vary. Students should be able to explain the reasoning behind their opinion.

   Note: Scientific monitoring of the Suffield Wildlife Area has shown an increase in biodiversity since the removal of the horses. Native grasses are returning and elk have been reintroduced.

Section 3: Lesson 4

Textbook questions 1, 2, 4, 8, 11, and 14 of "Wrap-up: Topics 6 to 8," page 79:

1. New breeds are developed through selective breeding (artificial selection).

2. Close monitoring of indicator species such as large carnivores, amphibians, and lichens help assess environmental impacts.

4. Seed banks and botanical gardens are used to preserve the genetic diversity of plants.

8. Artificial selection allowed Darwin to see how quickly changes can occur over just a few generations. Artificial selection let him see rapid changes occurring when only organisms with certain traits were selected for reproduction.

   Artificial selection and natural selection are both processes that lead to offspring with certain characteristics. In artificial selection, people do the selecting. Only organisms with desirable characteristics are selected to have offspring. Over time, this leads to offspring that have characteristics such as strength, obedience, or other characteristics people find desirable.

   Natural selection occurs in nature without people doing the selecting. In natural selection, only organisms that can survive natural conditions are allowed to reproduce. Over time, this leads to offspring that are more adapted to their habitat.

11. There are two ways of approaching this question. Variation within and between species results in natural selection. More young are produced than will survive to reproduce. Those with the most favourable characteristics will likely pass on their heritable traits. If the offspring were identical, there could be no real selection among differences.

    On the other hand, natural selection leads to adaptations to different niches. Natural selection results in variation. And natural selection and variation result in each other.

    Comment: This is like the question, Which comes first—the chicken or the egg?

14. The ant and plant are directly interdependent species. They have evolved together into very specialized roles. The extinction of either species would likely lead to the extinction of the other. A small initial decrease in biodiversity often leads to a further decrease in biodiversity.

Module Review

Textbook questions 2, 4, 11, 12, 17, 24, 30, and 41 from "Unit 1 Review," pages 84 to 87:

2. DNA is the blueprint of life. This substance controls the growth and activity of cells. DNA also carries heritable traits from parents to offspring.

4. **(a)** A new individual grows out of the side of its parent and then pinches off to live independently.

   (b) Asexual reproduction requires only one parent. In this type of reproduction the parent supports the offspring until it is ready for independence.

11. Continuous traits include height, weight, hair and skin colour, and intelligence.

12. **(a)** Darwin studied the creation of new breeds or varieties through the process of artificial selection. He observed niche-related variation on the Galápagos Islands. Darwin also noted environment-related variation in his extensive travels.

(b) The four statements that describe natural selection are the following:

- More offspring are produced than can survive.
- There is variation within a species.
- Some variations increase an individual's chances of surviving to reproduce (fitness).
- Positive heritable variations tend to increase in frequency over time.

17. Answers may vary. Humans have increased the diversity of domestic plants and animals through selective breeding and genetic engineering. Humans have decreased biodiversity in the wild by destroying habitat (e.g., agriculture, forestry, housing developments, recreational facilities); introducing exotic species; polluting; competing with wildlife for resources; and by overhunting.

24. There are very few cheetahs in the world. Their genetic diversity is already exceptionally low. Comparing genetic fingerprints helps determine which individuals to mate. By selecting for cheetahs not closely related, genetic diversity that still exists may be preserved.

30. The corridors would allow populations to mix. This would maintain genetic diversity within the populations.

41. Answers will vary. For example, a plant-specific insect should be introduced only after very careful study and monitoring. The introduced species may come to prefer a native plant and become a pest. It could then outcompete other native organisms. However, it would be a good idea if the insect continued to feed exclusively on purple loosestrife.

ASSIGNMENT BOOKLET 1B

Science 9
Module 1: Section 3 Assignment and Final Module Assignment

Home Instructor's and Student's Comments:

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Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

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- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
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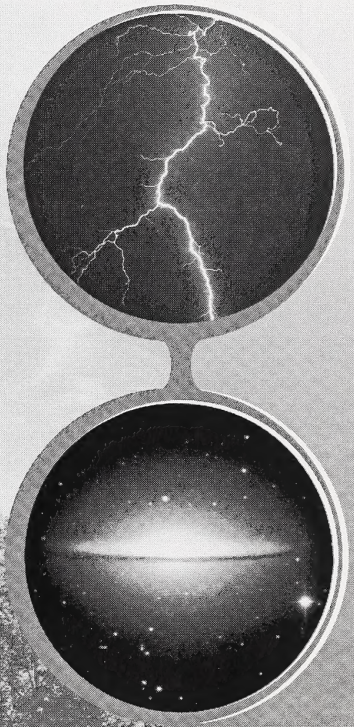
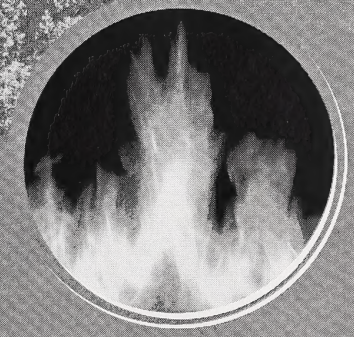
SCIENCE 9

Module 1

Biological Diversity

Assignment Booklet 1B





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FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 3 Assignment	26	
Final Module Assignment	35	
	61	

Teacher's Comments

Science 9
Module 1: Biological Diversity
Assignment Booklet 1B
Section 3 Assignment and Final Module Assignment
Learning Technologies Branch

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ASSIGNMENT BOOKLET 1B
SCIENCE 9: MODULE 1
SECTION 3 ASSIGNMENT AND FINAL MODULE ASSIGNMENT

Your mark for this module will be determined by how well you do your assignments.

This Assignment Booklet is worth 61 marks out of the total 122 marks for the assignments in Module 1. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

Section 3 Assignment: The Impact of Human Activities

(26)

Read all parts of your assignment carefully and record your answers in the appropriate places.

(5) **1.** After a campout, most of the people in the local outdoors group became ill with a throat infection. All received erythromycin, an antibiotic. The antibiotics killed the infection in all but one person. After the next meeting the majority of the campers had a recurrence of the infection. The second time, the erythromycin did not help.

This is an example of _____ selection. One person did not take all of the antibiotics. Like other organisms, the bacteria produce many young that will not _____ or reproduce. They also show _____ in their genetic traits. The bacteria that were _____ survived the negative environment created by the antibiotic. They then reproduced and passed on their positive _____ traits to some of their young.

(2) **2.** Explain why most animals are born without harmful inherited traits.

_____

_____

3. Over several generations, both artificial and natural selection bring about changes in the genetic material of a group of organisms.

(2) **a.** Both artificial and natural selection rely on _____ reproduction to make genetic changes. However, genetic change can sometimes occur through _____. This process results in new genes that were not inherited from either parent.

(4) **b.** The nucleus of a zygote contains structures made up of strands of genetic material. These structures are called _____. In the zygote, these structures are found in sets of _____. One is from the _____, and one is from the _____.

(1) **c.** People use _____ to bring the desirable traits of two different organisms together in the offspring.

(6) **4.** Sexually produced offspring _____ in their heritable traits. Some offspring will be _____ than others. The environment places demands on the individuals. Those that have the most favourable characteristics are more likely to _____ and _____. Over time, _____ selection causes these traits to become more common. The species become better adapted to their _____ in the local environment.

Return to page 53 of the Student Module Booklet and continue with Lesson 2.

(2) **5.** Suggest two possible consequences that could result from the accidental release of transgenic fish into a natural water system.

_____

_____

_____

_____

Return to page 58 of the Student Module Booklet and continue with Lesson 3.

Circle the letter of the best response for questions 6 and 7.

(1) **6.** Which of the following animal types has the least biological diversity?

A. sponges
B. mammals
C. insects and myriapods
D. fish

(1) **7.** Which of the following serves as the best bioindicator of the impact of humans on a habitat?

A. grizzly bears
B. ground squirrels
C. monarch butterflies
D. prairie grass

(2) 8. Explain why heat, light, and rainfall lead to more biodiversity.

_____

_____

Return to page 64 of the Student Module Booklet and continue with the Module Summary.

(35)

Final Module Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places.

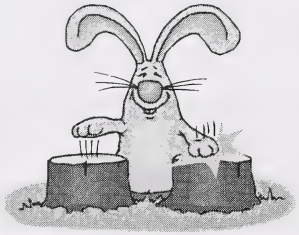
Use the following information and graphics to answer questions 1 to 4.

Use your imagination. Imagine that thousands of years ago a tectonic plate movement carried a large chunk of land several kilometres away from a mainland. It was located in an area that had a very stable or unchanging climate.

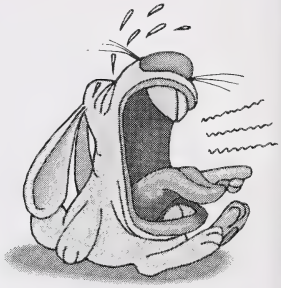
A large group of rabbits were the only mammals carried along on the new island. A zoologist recently did a study of the rabbits on this remote island. She made a photographic record of several typical descendants of the original group. Carefully study this group; then answer the following questions using the scientific concepts and terms learned in this module.

A.

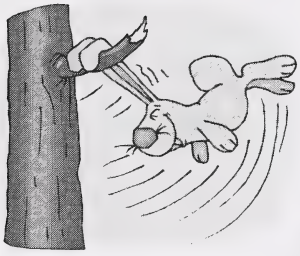
B.



C.



D.



E.

F.

G.

H.

I.

1. You can infer what purpose is served by adaptations. That is, you can infer functions related to individual adaptations.

(2) **a.** List two different, specific behavioural adaptations found in these rabbits. Make an inference about their functions.

(2) **b.** List two different, specific structural adaptations found in these rabbits. Make an inference about their functions.

2. The rabbit in C has received a nasty cut.

(1) **a.** Indicate the process that will repair the cut.

(1) **b.** Name the process by which genetic material will be copied during the repair.

3. The descendants of the original group of rabbits have come to use four different food sources—insects, fruits, fish, and plant fiber. Four groups use only one specific source, while a fifth group uses three of the four sources.

(5) **a.** Name and explain the process that caused this division into new species based on food sources.

(2) **b.** Classify the type of niches that the specialist rabbits occupy and the niches that the generalist rabbits occupy.

4. Complete the following statements. Use scientific terms to make meaningful statements based on the story of the island rabbits.

(2) **a.** Over the years, the rabbits split into distinct groups. In other words, they developed greater _____ through the process of _____.

(1) **b.** Fossil records showed that the original group of rabbits had short ears. Having very long mobile ears is a trait that did not exist in the original group of rabbits. The gene(s) for ear length must have _____ early in the rabbits' island history.

(1) **c.** _____ for limited resources is the likely cause for the formation of distinct groups among the rabbits.

(3) **d.** One of the swimming rabbit group's favourite foods is the "squishy-sphere" organism that lives in the water around the island. These spheres are formed from clumps of genetically identical single-celled organisms, which undergo _____ reproduction. The original parent cell simply duplicates its genetic contents. The parent cell then splits into two daughter cells. During the process, the genetic content is copied in a process known as _____. Occasionally, they follow a primitive form of sexual reproduction. This type of sexual reproduction is called _____.

(1) **e.** A chemical plant blew up hundreds of kilometres away from the island. The air and water became somewhat polluted. The population of the swimming rabbit group quickly dropped as a result, and many of their offspring died at a very young age. Their health and population gradually increased as the pollutant was removed from their habitat. This group could be considered a(n) _____, because its presence indicates environmental change.

(1) **f.** The number of whiskers, the length of feet, and the tendency to swing from trees are likely _____ traits.

(2) **g.** One species of rabbit has been forced out of a large section of the island. In other words, the rabbits have been _____ from that area. Another rabbit species was out-competed and no longer exists. It is now _____.

5. Complete the following questions.

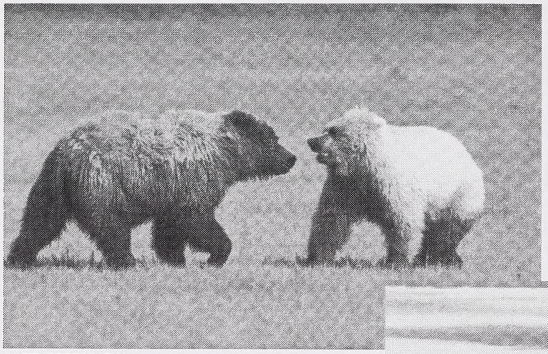
(3) **a.** Name three new types of biotechnologies.

_____

_____

_____

(3) **b.** Use the following photographs to answer the questions. The photo on the left is of grizzly bears, while polar bears are in the photo on the right.



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There is variation within a species and among species. The coat colour of the grizzly bears provides an example of variation _____ a species. Together, the two photographs show there is greater variation _____ species than _____ a species.

(3) **c.** The Yellowstone to Yukon Conservation Initiative (Y2Y) is a group of more than 250 Canadian and United States organizations. They are working together to create an uninterrupted corridor for animal movement along the Rocky Mountains. This strip of land would become a(n) _____ in which human activities would be restricted by law. Two other ways people can preserve biodiversity are by the use of _____ and _____.

(1) **d.** A single yeast cell can reproduce by growing young from its surface. This way of producing offspring is called _____.

(1) **e.** On very rare occasions, an unfertilized mammal egg divides into two through a process like mitosis. Then the two daughter cells rejoin and grow into a normal fetus. How would the genetic makeup of the resulting baby compare to its mother?

_____

_____

Submit your completed Assignment Booklet 1B to your teacher for assessment.

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The school you are registered with may require you to submit this signed form with your Assignment Booklet.

The Student's Declaration is to be signed by the student. If the student is under 16, the Supervisor's Declaration may need to be signed by the supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results. Please contact your school and ask if this completed form is required.

STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

_____

Student's Signature

SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by _____.

Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

_____

Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

_____

_____

_____

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